

RAW SEQUENCE LISTING

The Biotechnology Systems Branch of the Scientific and Technical
Information Center (STIC) no errors detected.

Application Serial Number: 10/751,235

Source: IFWO

Date Processed by STIC: 11-18-04

ENTERED



IFWO

RAW SEQUENCE LISTING

PATENT APPLICATION: US/10/751,235

DATE: 11/18/2004

TIME: 12:20:26

Input Set : A:\08604~2.txt

Output Set: N:\CRF4\11182004\J751235.raw

3 <110> APPLICANT: DellaPenna, Dean
 4 Tian, Li
 5 Kim, Joonyul
 7 <120> TITLE OF INVENTION: Novel Carotenoid Hydroxylases for Use in Engineering Carotenoid

8 Metabolism in Plants
 10 <130> FILE REFERENCE: MSU-08604
 12 <140> CURRENT APPLICATION NUMBER: 10/751,235
 13 <141> CURRENT FILING DATE: 2004-01-02
 15 <160> NUMBER OF SEQ ID NOS: 74
 17 <170> SOFTWARE: PatentIn version 3.2
 19 <210> SEQ ID NO: 1
 20 <211> LENGTH: 77
 21 <212> TYPE: PRT
 22 <213> ORGANISM: Arabidopsis thaliana
 24 <400> SEQUENCE: 1
 26 Leu Gln Pro Tyr Ala Glu Asp Gly Ser Ala Val Asn Met Glu Ala Lys
 27 1 5 10 15
 30 Phe Ser Gln Met Thr Leu Asp Val Ile Gly Leu Ser Leu Phe Asn Tyr
 31 20 25 30
 34 Asn Phe Asp Ser Leu Thr Thr Asp Ser Pro Val Ile Glu Ala Val Tyr
 35 35 40 45
 38 Thr Ala Leu Lys Glu Ala Glu Leu Arg Ser Thr Asp Leu Leu Pro Tyr
 39 50 55 60
 42 Trp Lys Ile Asp Ala Leu Cys Lys Ile Val Pro Arg Gln
 43 65 70 75
 46 <210> SEQ ID NO: 2
 47 <211> LENGTH: 77
 48 <212> TYPE: PRT
 49 <213> ORGANISM: Arabidopsis thaliana
 51 <400> SEQUENCE: 2
 53 Leu Asp Ala Ala Ala Leu Lys Gly Glu Glu Val Glu Met Glu Ser Leu
 54 1 5 10 15
 57 Phe Ser Arg Leu Thr Leu Asp Ile Ile Gly Lys Ala Val Phe Asn Tyr
 58 20 25 30
 61 Asp Phe Asp Ser Leu Thr Asn Asp Thr Gly Val Ile Glu Ala Val Tyr
 62 35 40 45
 65 Thr Val Leu Arg Glu Ala Glu Asp Arg Ser Val Ser Pro Ile Pro Val
 66 50 55 60
 69 Trp Asp Ile Pro Ile Trp Lys Asp Ile Ser Pro Arg Gln
 70 65 70 75
 73 <210> SEQ ID NO: 3
 74 <211> LENGTH: 84
 75 <212> TYPE: PRT

(file)

RAW SEQUENCE LISTING

DATE: 11/18/2004

PATENT APPLICATION: US/10/751,235

TIME: 12:20:26

Input Set : A:\08604~2.txt

Output Set: N:\CRF4\11182004\J751235.raw

76 <213> ORGANISM: Arabidopsis thaliana

78 <400> SEQUENCE: 3

80 Glu Lys Leu Ile Arg Glu Lys Glu Thr Ser Ser Gly Glu Asp Thr Ile

81 1 5 10 15

84 Glu Leu Asp Leu Glu Ala Glu Phe Ser Ser Leu Ala Leu Asp Ile Ile

85 20 25 30

88 Gly Leu Ser Val Phe Asn Tyr Asp Phe Gly Ser Val Thr Lys Glu Ser

89 35 40 45

92 Pro Val Ile Lys Ala Val Tyr Gly Thr Leu Phe Glu Ala Glu His Arg

93 50 55 60

96 Ser Thr Phe Tyr Phe Pro Tyr Trp Asn Phe Pro Pro Ala Arg Trp Ile

97 65 70 75 80

100 Val Pro Arg Gln

104 <210> SEQ ID NO: 4

105 <211> LENGTH: 539

106 <212> TYPE: PRT

107 <213> ORGANISM: Arabidopsis thaliana

109 <400> SEQUENCE: 4

111 Met Glu Ser Ser Leu Phe Ser Pro Ser Ser Ser Tyr Ser Ser Leu

112 1 5 10 15

115 Phe Thr Ala Lys Pro Thr Arg Leu Leu Ser Pro Lys Pro Lys Phe Thr

116 20 25 30

119 Phe Ser Ile Arg Ser Ser Ile Glu Lys Pro Lys Pro Lys Leu Glu Thr

120 35 40 45

123 Asn Ser Ser Lys Ser Gln Ser Trp Val Ser Pro Asp Trp Leu Thr Thr

124 50 55 60

127 Leu Thr Arg Thr Leu Ser Ser Gly Lys Asn Asp Glu Ser Gly Ile Pro

128 65 70 75 80

131 Ile Ala Asn Ala Lys Leu Asp Asp Val Ala Asp Leu Leu Gly Gly Ala

132 85 90 95

135 Leu Phe Leu Pro Leu Tyr Lys Trp Met Asn Glu Tyr Gly Pro Ile Tyr

136 100 105 110

139 Arg Leu Ala Ala Gly Pro Arg Asn Phe Val Ile Val Ser Asp Pro Ala

140 115 120 125

143 Ile Ala Lys His Val Leu Arg Asn Tyr Pro Lys Tyr Ala Lys Gly Leu

144 130 135 140

147 Val Ala Glu Val Ser Glu Phe Leu Phe Gly Ser Gly Phe Ala Ile Ala

148 145 150 155 160

151 Glu Gly Pro Leu Trp Thr Ala Arg Arg Arg Ala Val Val Pro Ser Leu

152 165 170 175

155 His Arg Arg Tyr Leu Ser Val Ile Val Glu Arg Val Phe Cys Lys Cys

156 180 185 190

159 Ala Glu Arg Leu Val Glu Lys Leu Gln Pro Tyr Ala Glu Asp Gly Ser

160 195 200 205

163 Ala Val Asn Met Glu Ala Lys Phe Ser Gln Met Thr Leu Asp Val Ile

164 210 215 220

167 Gly Leu Ser Leu Phe Asn Tyr Asn Phe Asp Ser Leu Thr Thr Asp Ser

168 225 230 235 240

171 Pro Val Ile Glu Ala Val Tyr Thr Ala Leu Lys Glu Ala Glu Leu Arg

RAW SEQUENCE LISTING

DATE: 11/18/2004

PATENT APPLICATION: US/10/751,235

TIME: 12:20:26

Input Set : A:\08604-2.txt

Output Set : N:\CRF4\11182004\J751235.raw

```

172          245          250          255
175 Ser Thr Asp Leu Leu Pro Tyr Trp Lys Ile Asp Ala Leu Cys Lys Ile
176          260          265          270
179 Val Pro Arg Gln Val Lys Ala Glu Lys Ala Val Thr Leu Ile Arg Glu
180          275          280          285
183 Thr Val Glu Asp Leu Ile Ala Lys Cys Lys Glu Ile Val Glu Arg Glu
184          290          295          300
187 Gly Glu Arg Ile Asn Asp Glu Glu Tyr Val Asn Asp Ala Asp Pro Ser
188 305          310          315          320
191 Ile Leu Arg Phe Leu Leu Ala Ser Arg Glu Glu Val Ser Ser Val Gln
192          325          330          335
195 Leu Arg Asp Asp Leu Leu Ser Met Leu Val Ala Gly His Glu Thr Thr
196          340          345          350
199 Gly Ser Val Leu Thr Trp Thr Leu Tyr Leu Leu Ser Lys Asn Ser Ser
200          355          360          365
203 Ala Leu Arg Lys Ala Gln Glu Glu Val Asp Arg Val Leu Glu Gly Arg
204          370          375          380
207 Asn Pro Ala Phe Glu Asp Ile Lys Glu Leu Lys Tyr Ile Thr Arg Cys
208 385          390          395          400
211 Ile Asn Glu Ser Met Arg Leu Tyr Pro His Pro Pro Val Leu Ile Arg
212          405          410          415
215 Arg Ala Gln Val Pro Asp Ile Leu Pro Gly Asn Tyr Lys Val Asn Thr
216          420          425          430
219 Gly Gln Asp Ile Met Ile Ser Val Tyr Asn Ile His Arg Ser Ser Glu
220          435          440          445
223 Val Trp Glu Lys Ala Glu Glu Phe Leu Pro Glu Arg Phe Asp Ile Asp
224 450          455          460
227 Gly Ala Ile Pro Asn Glu Thr Asn Thr Asp Phe Lys Phe Ile Pro Phe
228 465          470          475          480
231 Ser Gly Gly Pro Arg Lys Cys Val Gly Asp Gln Phe Ala Leu Met Glu
232          485          490          495
235 Ala Ile Val Ala Leu Ala Val Phe Leu Gln Arg Leu Asn Val Glu Leu
236          500          505          510
239 Val Pro Asp Gln Thr Ile Ser Met Thr Thr Gly Ala Thr Ile His Thr
240          515          520          525
243 Thr Asn Gly Leu Tyr Met Lys Val Ser Gln Arg
244          530          535

```

247 <210> SEQ ID NO: 5

248 <211> LENGTH: 2467

249 <212> TYPE: DNA

250 <213> ORGANISM: Arabidopsis thaliana

252 <400> SEQUENCE: 5

```

253 atggagtctt cactcttttc tccatcttcc tcttcttact cttctctctt cactgcaaaa      60
255 cctacgcgtc ttttatcacc aaaacccaaa ttcacattct ccatcagatc ctccattgag      120
257 aaacccaac ccaaactcga gaccaattca tcgaaatccc aatcatgggt cagtcccgat      180
259 tggctcaca cactcactcg taccctttcc tcaggaaaaa acgacgagtc aggtatacca      240
261 atcgcgaaac cgaagctcga cgaatgctgc gatctcctcg gaggtgctct cttcttacct      300
263 ctctacaaat ggatgaatga gtacggaccc atttaccgtc tcgctgctgg tctctgtaat      360
265 ttcgtaattg tgagcgaccc agcgatagct aaacatgttt tgaggaatta tccaaagtac      420

```

RAW SEQUENCE LISTING

DATE: 11/18/2004

PATENT APPLICATION: US/10/751,235

TIME: 12:20:26

Input Set : A:\08604-2.txt

Output Set : N:\CRF4\11182004\J751235.raw

```

267 gctaaaggct tagtcgctga agtctctgaa tttctatttg gttcggggtt cgtatcgct 480
269 gaaggacctc tttggacagt aatttcactt cctcctatct caattttgaa gtttttgaa 540
271 ttgtggaagt aatgtgtgac tgtcttgat gataagtaac tctaatttta gggtttagat 600
273 tccaatcttc tctattgggc ttagctgaag tctgattttt tacataggcg aggcgtagag 660
275 cgggtggtcc atcgcttcac aggaggtatt tctctgtgat tgtggagaga gtattctgca 720
277 aatgtgcaga gaggcttggt gagaagttgc agccttatgc agaagacgga agtgctgtga 780
279 atatggaagc gaagtctctc cagatgacac ttgatgtcat tgggttgtct ctttttaact 840
281 acaatttcga ttctttgact actgatagtc ctgtcattga agctgtttac actgctctta 900
283 aagaagctga gcttcgttct actgatcttc tgccatattg gaaggcaagt ttctgtgtt 960
285 tttctgtgg tttgttgatt gtgtggaaca attggattct tgttaattga gagggtttg 1020
287 ttgtttttt cagatcgatg cattgtgtaa gatagtcctc agacagggtg aagctgaaaa 1080
289 ggctgtaact ttgataaggg aaactgttga agaccttatt gctaagtgtg aagaaattgt 1140
291 cgaaagagaa ggcgaagaa tcaatgatga ggagtatgta aatgatgctg acccaagtat 1200
293 cctgcgttcc ttgcttgcaa gcagagaaga ggtttaaact ttttccctta agtttataag 1260
295 caaatttggc ctttcattat cgcataatcg aagctgatgt tgcattgtga gggttttcag 1320
297 gtatcaagtg tgcagttacg ggatgatctt ctctcaatgc tcgtagcggg tcatgaaacc 1380
299 actggatctg tctcacttg gacactttat ctccaaagta aggtacctta atgtatcttc 1440
301 tactttgcta tgctagagaa tttacttgga tgggagcttc tctgttctca tttacctctt 1500
303 caaattctct atgttcatag aactcatctg cattaaggaa agcacaagaa gaagtagaca 1560
305 gagtgttaga aggaagaaac ccggctttcg aggatataaa ggagttgaag tacatcactc 1620
307 gttgtataaa cgagtcaatg cgtctctatc ctcatcctcc tgtaagcaat caagctcatc 1680
309 tctctaatta ttcatgaact aaattttctg attgatttgt ttctggtag gtcttgataa 1740
311 gaagagctca agttcctgac attcttctcg ggaactataa ggtcaatacc ggacaagaca 1800
313 ttatgatttc agtctataac atccatcggt cttccgaggt acagttctct tcttctctc 1860
315 gtccatagta taacataggg gagcctaata cttctcttca atgatctttg tgtggttcgg 1920
317 atatctaacc ggagtggaca ttcctagtat tacattcatg cccacatttc ttatgtgtt 1980
319 gttgtttgtt attccaaagg tatgggaaaa agctgaggaa tttctgctg aacgattcga 2040
321 catagatggc gcaatcccta acgaaacaaa cactgatttc aagtaaaact agtagaacac 2100
323 atcttttgac acaaaactact gaatcaagat tagtggtttt gattagggaa tttaaaagat 2160
325 gattttcttt tttcaccaga ttcacccat tcagtggagg gcctagaaaa tgtgtaggcg 2220
327 atcagtttgc attgatggag gcaattgtgg cactcgcggt gtttcttcag cggttaaacg 2280
329 ttgagcttgt tctgatcgag accattagca tgaccacagg agcaaccata cacaccacca 2340
331 atgtatgcca atgttctcac actcgagaga ttaatgagag tgtctgtttt gtttagaatg 2400
333 attccaattt ctctaattgt gatattttca atttcaggga ttgtatatga aggtgagcca 2460
335 aaggtaa 2467
338 <210> SEQ ID NO: 6
339 <211> LENGTH: 4170
340 <212> TYPE: DNA
341 <213> ORGANISM: Arabidopsis thaliana
343 <400> SEQUENCE: 6
344 cctgggtcaag agagagcaga aattgctgat acgcatcttt gtcagagaga agcttctctga 60
346 gttcatccac gctacagaaa agtatacact attcaaaaag aagacataca aaaaaaacgc 120
348 aactcgcaga gaaggataac aaacaaacaa acaaaaagag caaacctttt gtctttcaag 180
350 aagacgataa tgccagctgc ttcacccggt gatacttgtg ctgaaatctg acctgaactt 240
352 tgaggccggg atgagcttgg cgagctaaact aaagaaggcg agtaccatgg cgactgtgaa 300
354 gaagcttctc taggacgaga ttgcccttgt tgttggtctt ttgatccctc tcacgtacac 360
356 aacaaaaaaa agaaacatca tcaactaact atctcagctt ccaagttaat ataatacatc 420
358 acctcataaa cttgaaagggt gcatttatac agcacatcat tgtaaaccta atatcagtaa 480
360 ctatgaaccc taaatcagta gctgagcaaa atctacactt gtcaattcac ctcaaaaacc 540

```

RAW SEQUENCE LISTING

DATE: 11/18/2004

PATENT APPLICATION: US/10/751,235

TIME: 12:20:26

Input Set : A:\08604-2.txt

Output Set : N:\CRF4\11182004\J751235.raw

362	tcaaatatat	cattatagct	caacaaacta	cacaacaaca	agatttcctt	aatcgctaac	600
364	agacctaatg	tctggatcac	gcaatttcat	caataacata	tgaatcagat	ggcaaaaaat	660
366	tcgcaaaatc	ataccagaaa	ttgaacatcg	tttctagaat	tcgccgacta	acgaaaggaa	720
368	ttgacttttt	cttgcttctt	tgtacttctt	cttcctacca	gategacaaa	atttaacaac	780
370	tttacagaaa	cagagtttac	agagttttca	agaaaattcg	atcttctctg	tttcgtttca	840
372	gatttttgcta	cttgctttta	aaaggcccaa	atacgaggag	gcccatatta	agtttttgatt	900
374	aacaaaacgt	agtcgtttta	tgcacgctcg	tccttatcca	cgcgtaacgg	ttcgcgtttc	960
376	tacacagagt	caaatatttc	tgcacggaag	cttcgaaaag	aggtcatcaa	tggagtcttc	1020
378	actcttttct	ccatcttctt	cttcttactc	ttctctcttc	actgcaaaac	ctacgcgtct	1080
380	tttatcacca	aaacccaaat	tcacattctc	catcagatcc	tccattgaga	aacccaaacc	1140
382	caaactcgag	accaattcat	cgaaatccca	atcatgggtc	agtcgccgatt	ggctcacaac	1200
384	actcactcgt	accctttctt	caggaaaaaa	cgacgagtca	ggtataccaa	tcgcgaacgc	1260
386	gaagctcgac	gatgtcgctg	atctcctcgg	aggtgctctc	ttcttacctc	tctacaaatg	1320
388	gatgaatgag	tacggaccca	tttacgcgtc	cgctgctggg	cctcgtaatt	tcgtaattgt	1380
390	gagcgaccca	gcgatagcta	aacatgtttt	gaggaattat	ccaaagtacg	ctaaaggctt	1440
392	agtcgctgaa	gtctctgaat	ttctatttgg	ttcgggtttc	gctatcgctg	aaggacctct	1500
394	ttggacagta	atttcatctc	ctcctatctc	aattttgaag	tttttggagt	tgtggaagta	1560
396	atgtgtgact	gtcttgtatg	ataagtaact	ctaattttag	ggtttagatt	ccaatcttct	1620
398	ctattgggct	tagctgaagt	ctgatttttt	acataggcga	ggcgtagagc	gggtggtcca	1680
400	tcgcttcaca	ggaggatttt	gtctgtgatt	gtggagagag	tattctgcaa	atgtgcagag	1740
402	aggcttggtg	agaagttgca	gccttatgca	gaagacggaa	gtgctgtgaa	tatggaagcg	1800
404	aagttctctc	agatgacact	tgatgtcatt	gggttgtctc	tttttaacta	caatttcgat	1860
406	tctttgacta	ctgatagtc	tgtcattgaa	gctgtttaca	ctgctcttaa	agaagctgag	1920
408	cttcggttcta	ctgatcttct	gccatattgg	aaggcaagtt	tctgtgtttt	tttctgtggt	1980
410	ttgttgattg	tgtggaacaa	ttggattctt	gttaattgag	aggggttggt	tgtttttttc	2040
412	agatcgatgc	attgtgtaag	atagtcccg	gacaggtgaa	agctgaaaag	gctgtaactt	2100
414	tgataaggga	aactgttgaa	gaccttattg	ctaagtgtaa	agaaattgtc	gaaagagaag	2160
416	gcgaaagaat	caatgatgag	gagtatgtaa	atgatgctga	cccaagtatc	ctgcgtttct	2220
418	tgcttgcaag	cagagaagag	gtttaaactt	ttttccttaa	gtttataagc	aaatttgccc	2280
420	tttcattatc	gcataatcga	agctgatgtt	gcattgtgag	ggttttcagg	tatcaagtgt	2340
422	gcagttacgg	gatgatcttc	tctcaatgct	cgtagcgggt	catgaaacca	ctggatctgt	2400
424	cctcacttgg	acactttatc	tcctaagtaa	ggtaccttaa	tgtatcttct	actttgtctat	2460
426	gctagagaat	ttacttggat	gggagcttct	ctgttctcat	ttacctcttc	aaattctcta	2520
428	tgttcataga	actcatctgc	attaaggaaa	gcacaagaag	aagtagacag	agtgttagaa	2580
430	ggaagaaacc	cggctttcga	ggatataaag	gagttgaagt	acatcactcg	ttgtataaac	2640
432	gagtcaatgc	gtctctatcc	tcctctctct	gtaagcaatc	aagctcatct	ctctaattat	2700
434	tcatgaacta	aattttctga	ttgatttggt	tcctggtagg	tcttgataag	aagagctcaa	2760
436	gttcctgaca	ttcttctcgg	gaactataag	gtcaataaccg	gacaagacat	tatgatttca	2820
438	gtctataaca	tccatcgttc	ttccgaggta	cagttctctt	ccttctctcg	tccatagtat	2880
440	aacatagggg	agcctaatac	ttctcttcaa	tgatctttgt	gtgggttcgga	tatctaaccg	2940
442	gagtggacat	tcttagtatt	acattcatgc	ccacatttct	tatgtgtttg	ttgtttgtta	3000
444	ttccaaaggt	atgggaaaaa	gctgaggaat	ttctgcctga	acgattcgac	atagatggcg	3060
446	caatccctaa	cgaacaaac	actgatttca	agtaaaactca	gtagaacaca	tcttttgaca	3120
448	caaactactg	aatcaagatt	agtgggtttg	attaggggaat	ttaaaagatg	attttctttt	3180
450	ttcaccagat	tcattccatt	cagtgagggg	cctagaaaat	gtgtaggcga	tcagtttgca	3240
452	ttgatggagg	caattgtggc	actcgcggtg	tttcttcagc	ggttaaacgt	tgagctggtt	3300
454	cctgatcaga	ccattagcat	gaccacagga	gcaaccatac	acaccaccaa	tgtatgccaa	3360
456	tgttctcaca	ctcgagagat	taatgagagt	gtctgttttg	tttagaatga	ttccaatttc	3420
458	tctaagtctg	atattttcaa	tttcagggat	tgtatatgaa	ggtgagccaa	aggtaaaaac	3480

RAW SEQUENCE LISTING ERROR SUMMARY
PATENT APPLICATION: US/10/751,235

DATE: 11/18/2004
TIME: 12:20:27

Input Set : A:\08604-2.txt

Output Set: N:\CRF4\11182004\J751235.raw

Please Note:

Use of n and/or Xaa have been detected in the Sequence Listing. Please review the Sequence Listing to ensure that a corresponding explanation is presented in the <220> to <223> fields of each sequence which presents at least one n or Xaa.

Seq#:12; Xaa Pos. 1,3,4,6

Seq#:14; Xaa Pos. 2,3,5,6,7,9

Seq#:17; Xaa Pos. 529

Seq#:23; N Pos. 1587

VERIFICATION SUMMARY

DATE: 11/18/2004

PATENT APPLICATION: US/10/751,235

TIME: 12:20:27

Input Set : A:\08604~2.txt

Output Set: N:\CRF4\11182004\J751235.raw

L:579 M:300 W: (50) Intentionally skipped Sequence, : Sequence Id (8) SEQUENCE:
L:584 M:300 W: (50) Intentionally skipped Sequence, : Sequence Id (9) SEQUENCE:
L:657 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:12 after pos.:0
L:701 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:14 after pos.:0
L:1012 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:17 after pos.:528
L:1441 M:341 W: (46) "n" or "Xaa" used, for SEQ ID#:23 after pos.:1560
L:4278 M:300 W: (50) Intentionally skipped Sequence, : Sequence Id (58) SEQUENCE: